

Undergraduate Thesis Prospectus

Meals on Wheels' Volunteer and Staff Portal

(technical research project in Computer Science)

Commercialization and Consumption: Food Waste in America

(STS research project)

by

Kyle Leisure

November 24, 2019

technical project collaborators:

Michael Benos
Alexander Hicks
Kevin Naddoni
Maxwell Patek
Joshua Santana
Nathanael Strawser

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

signed: _____ date: _____

approved: _____ date: _____
Peter Norton, Department of Engineering and Society

approved: _____ date: _____
Ahmed Ibrahim, Department of Computer Science

General research problem

How can hunger in America be reduced? During 2017, in about 15 million American households, at least one person had insufficient access to food (Coleman-Jensen et al., 2018). Malnutrition contributes to a variety of health problems, especially in children (WHO, 2018).

Meals on Wheels' Volunteer and Staff Portal

Despite America being one of the richest countries in the world, an estimated eight million of its aging citizens face the threat of hunger (World Bank, 2019; NCOA, 2015). Meals on Wheels is America's oldest and largest organization dedicated to mitigating this issue through community chapters (MOWA, 2019). The non-profit's local chapter delivers meals to disabled or elderly people in the Charlottesville-Albemarle area who cannot cook or buy food themselves. With the help of volunteers, the organization packs, labels, and distributes meals to customers via various delivery routes. In addition, volunteers drive a few shuttle routes to deliver meals to locations outside of the Charlottesville-Albemarle area (A. Dudley, personal communication, September 27, 2019).

A small team of paid staff administers Charlottesville's Meals on Wheels chapter by managing delivery routes, maintaining current and prospective customer information, and ensuring that all daily jobs are filled by at least one volunteer (S. Bayker, personal communication, September 13, 2019). These administrative tasks can get rather complex due to a combination of daily, weekly, biweekly, monthly, and one-time volunteer shifts and customer needs. Also, most of the meals delivered are sourced via donation, which makes predicting supply difficult.

The greater U.S. Meals on Wheels organization sells professional software to help staff manage the complexity of their tasks; however, the Charlottesville office cannot afford it (A. Dudley, personal communication, October 11, 2019). Thus, staff managed volunteers, customers, and routes by hand until approximately three years ago, when a University of Virginia computer science capstone team created a web portal for them. Adopting this web portal gave Meals on Wheels' staff more time to focus on essential tasks by automating physical reports and tedious manual tasks.

A subsequent capstone team updated the web portal to its current state, but Meals on Wheels' staff still desires improvements. First, staff complained that the web application has become increasingly slow over time. After examining the current codebase, we believe this slowness is likely due to its cluttered, unclear data storage and the use of an inexpensive hosting solution. Second, staff identified several organizational oddities within the app layout, making some tasks take longer than necessary. Finally, staff requested the addition of new features, including historical report generation and general search functionality.

It is clear that the system needs an update; however, the technical debt¹ accumulated by the separate capstone teams developing features over a two-year period necessitates a rewrite. Our capstone team's goal, therefore, is to write a new application that satisfies Meals on Wheels' needs and has a more reasonable and maintainable backend for long-term deployment, including state-of-the-art modularity via Docker, normalized database models², and cost-effective cloud deployment via Amazon Web Services. By redesigning and modernizing from the ground up, our project should enable Meals on Wheels to operate at lower costs and function more quickly;

¹ According to Allman (2012), technical debt is "when engineers take shortcuts that fall short of best practice."

² Normalization is the process of organizing a database to eliminate redundancy and inconsistent dependency (Microsoft, 2017).

the organization should have more time and money to help customers in need. We aim to provide a minimum viable product including features such as account creation, assigning volunteers to routes, and volunteer substitution by the end of the current year. We plan on releasing the complete, working product by May 2020.

Requirements for a Minimum Viable Product

- All Users
 - As a user, I should be able to create my own account (including custom username), so I can log in and see personalized information.
 - As a user, I should be able to request to change my password in case I forget it.
- Volunteers
 - As a volunteer, I should be able to release my route on a day, so someone else can substitute for that job.
 - As a volunteer, I should be able to pick up a released route on a particular day, so no routes go without a volunteer.
 - As a volunteer, I should be able to pick up a new route that has not been assigned to any volunteer, so I can plan my hours in advance.
- Staff
 - As staff, I should be able to create clients, so I can accommodate a growing client base.
 - As staff, I should be able to generate reports, so I can prepare daily operations.
 - As staff, I should be able to manually create delivery routes, so I can customize the volunteer's tasks.
 - As staff, I should be able to manually delete delivery routes, so I can avoid cluttering the portal with unused routes.
 - As staff, I should be able to assign volunteers to recurring routes, so I can plan delivery.
 - As staff, I should be able to substitute one-time volunteers for jobs, so I can ensure that all necessary jobs are filled.
 - As staff, I should be able to release volunteers from their recurring routes, so I can assign another volunteer to the recurring route.
 - As staff, I should be able to one-time release volunteers from their routes, so I can allow other volunteers to substitute.

- As staff, I should be able to print reports that have been generated by any staff, so can have physical report copies.
- As staff, I should be able to see who is volunteering on a particular day, so I can stay organized and communicate as necessary.

Commercialization and Consumption: Food Waste in America

How do food retailers, food service establishments, advocacies, and consumer behaviors shape food waste in America? The USDA estimates that 30 to 40 percent of edible food in the United States is wasted (USDA, n.d.a). The quantity of wasted food appears to be ample to offset insufficient food access many times over.

The causes of food waste are well documented. Buzby et al. (2014) attribute waste in food retail to buyers' visual standards and to shelf overstocking. Ho et al. (2016) found that date labels, such as Sell By and Use By dates, can confuse consumers and lead to waste. Liu and McCarthy (2017) correlated food waste with consumers' age and waste awareness. Heikkila et al. (2015) found that 20% of food "handled and prepared" in Finland's food service industry is wasted and that buffet services are major contributors to the waste.

Consumers, food service establishments, food retailers, advocacies, and charities affect food waste. Food service establishments include restaurants and university dining halls. Restaurants, aiming to please consumers with quality food and to earn favorable reviews, may discard unattractive food deemed unservable and uneaten served food (Barclay, 2012; Nania, 2019). Restaurants' means of waste reduction vary by restaurant type. By mispredicting demand on a particular day, a dining hall can waste massive amounts of food. Some recognize this waste potential and seek to reduce it (UVA Dining, 2019).

Food retailers include grocery and warehouse stores. Grocery stores, to generate revenue, must cultivate their reputations. Grocers find unattractive produce harder to sell, but many wish to avoid a reputation for food waste (Baldwin, 2016). Warehouse stores, such as Costco, have similar interests (Costco, 2019). Stores typically have a large food inventory, so their potential for waste is high if demand does not meet supply.

Government agencies, such as EPA, FDA, and USDA, are among the many organizations striving to reduce food waste in America. The EPA (2016) warns that food waste generates substantial methane emissions from landfills. The FDA (2019) publishes guides to explain food labels to consumers. The USDA (n.d.b) points out the direct relation between food and resource waste. The three agencies have an official agreement to cooperate to reduce food waste (Gottlieb et al., 2018).

Some food kitchens, in the interest of reducing local hunger, discourage food waste by urging people to donate food that would otherwise have been discarded (Kitchens for Good, 2019). Such charities, however, may not reduce food waste as much as they may appear to. Donated perishable food may be wasted if it amounts to more than can be eaten or if it doesn't meet consumers' dietary restrictions (MOWCA, 2016).

References

- Allman, E. (2012). Managing technical debt. *Communications of the ACM*, 55(5), 50. <https://doi.org/10.1145/2160718.2160733>
- Baldwin, S. (2016, July 19). One ‘perfect’ solution for saving ugly apples. *Walmart*. <https://corporate.walmart.com/newsroom/sustainability/20160719/one-perfect-solution-for-saving-ugly-apples>
- Barclay, E. (2012, November 12). For restaurants, food waste is seen as a low priority. *NPR*. <https://www.npr.org/sections/thesalt/2012/11/27/165907972/for-restaurants-food-waste-is-seen-as-low-priority>
- Buzby, J. C., Hyman, J., Wells, H. F. (2014, February). The estimated amount, value, and calories of postharvest food losses at the retail and consumer levels in the United States. *EIB-121*. U.S. Department of Agriculture, Economic Research Service. https://www.ers.usda.gov/webdocs/publications/43833/43680_eib121.pdf?v=0
- Coleman-Jensen, A., Gregory, C. A., Rabbitt, M. P., Singh, A. (2018). Household food security in the United States in 2017. *ERR-256*. U.S. Department of Agriculture, Economic Research Service. <https://www.ers.usda.gov/webdocs/publications/90023/err-256.pdf?v=0>
- Costco. (2019, September). Waste stream management. <https://www.costco.com/sustainability-waste-stream-management.html>
- EPA. (2016, April 22). U.S. Environmental Protection Agency. America’s food waste problem. <https://www.epa.gov/sciencematters/americas-food-waste-problem>
- FDA. (2019, May 23). U.S. Food and Drug Administration. Confused by date labels on packaged Foods?. <https://www.fda.gov/consumers/consumer-updates/confused-date-labels-packaged-foods>
- Gottlieb, S., Perdue, S., Wheeler, A. (2018, October 18). Formal agreement between EPA, USDA, and FDA relative to cooperation and coordination on food loss and waste. <https://www.fda.gov/food/domestic-interagency-agreements-food/formal-agreement-between-epa-usda-and-fda-relative-cooperation-and-coordination-food-loss-and-waste>
- Heikkila, L., Katajajuuri, J., Reinikainen, A., Silvennoinen, K. (2015, December). Food waste volume and origin: Case studies in the Finnish food service sector. *Waste Management*, 46, 140-145. Science Direct.
- Ho, S., Rickard, B. J., Saputo, R.I, Wilson, N. L.W. (2017, January). Food waste: The role of date labels, package size, and product category. *Food quality and preference*, 55, 35-44. Science Direct.

- Kitchens for Good. (2019). Reducing food waste.
<https://kitchensforgood.org/reducing-food-waste/>
- Liu, H. B., McCarthy, B. (2017, May). Food waste and the ‘green’ consumer. *Australasian Marketing Journal*, 25(2), 126-132. Science Direct.
- Microsoft (2017). Description of the database normalization basics.
<https://support.microsoft.com/en-us/help/283878/description-of-the-database-normalization-basics>.
- MOWA. (2019). Meals on Wheels America. National Office.
<https://www.mealsonwheelsamerica.org/learn-more/national>
- MOWCA. (2016). Meals on Wheels of Charlottesville/Albemarle. About our clients and our service. <https://www.cvillemeals.org/about>
- Nania, Rachel. (2019, April 17). From trash to tacos: DC restaurants work to reduce food waste. *WTOP*.
<https://wtop.com/food-restaurant/2019/04/from-trash-to-tacos-dc-restaurants-work-to-reduce-food-waste/>
- NCOA. (2015, June 4). National Council On Aging. Facts About Senior Hunger.
<https://www.ncoa.org/news/resources-for-reporters/get-the-facts/senior-hunger-facts/>
- USDA. (n.d.). United States Department of Agriculture. Food Waste FAQs.
<https://www.usda.gov/foodwaste/faqs>
- USDA. (n.d.). United States Department of Agriculture. Why should we care about food waste?.
<https://www.usda.gov/foodlossandwaste/why>
- UVA Dining. (2019). University of Virginia Dining. What we’re doing on grounds.
<https://virginia.campusdish.com/en/Sustainability/WhatWeAreDoing>
- WHO. (2018, February 16). World Health Organization. Malnutrition. *WHO*.
<https://www.who.int/news-room/fact-sheets/detail/malnutrition>
- World Bank (2019). GDP per capita. <https://data.worldbank.org/indicator/ny.gdp.pcap.cd>